

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. - 6. (canceled).

7. (previously presented): An automatic programming device that creates a machining program for machining a workpiece into a product model with a machining tool, where an area for the machining is determined by using a work model and the product model with a numerical control device for a two-spindle machine having a first main spindle and a sub-spindle and a one-spindle machine having a second main spindle, the automatic programming device comprising:

a first machining-program creating unit that creates a machining program for the two-spindle machine, including a first machining program for a first process that is performed by using the first main spindle and a second machining program for a second process that is performed by using the sub-spindle;

a second machining-program creating unit that creates a machining program for the one-spindle machine, including a third machining program for a third process and a fourth machining program for a fourth process that are performed by using the second main spindle; and

a selecting unit that determines a type of a machine to use, and selects either one of the first machining-program creating unit and the second machining-program creating unit to start, based on the determined type of the machine,

wherein the first machining-program creating unit executes a first process development processing for dividing a first machining for the first process and a second machining for the

second process into a unit of machining, wherein the unit of machining comprises the first machining, and in the unit of machining, a continuous machining is performed with said first main spindle, said sub-spindle, and said machining tool, and

wherein the second machining-program creating unit executes a second process development processing for dividing a third machining for the third process and a fourth machining for the fourth process into the unit of machining, separately for the third machining and the fourth machining.

8. (previously presented): The automatic programming device according to claim 7, wherein the first machining-program creating unit comprises:

- a product-model setting unit that selectively sets the product model;

- a work-model setting unit that selectively sets the work model;

- a jig setting unit that sets a jig for each of the first process and the second process;

- a registration setting unit that executes a registration process between the product model and the work model in each of the first process and the second process;

- a selection unit, which determines the machining tool to use for the machining of the workpiece and cutting conditions;

- a process-division setting unit that sets a process dividing position between the first process and the second process;

- a process-development processing unit that divides the first machining and the second machining into the unit of machining; and

- a program-development processing unit that creates the first machining program and the second machining program based on the divided units of machining of the first and

second machining processes, the determined machining tool, and the determined cutting conditions.

9. (previously presented): The automatic programming device according to claim 7, wherein the second machining-program creating unit comprises:

- a product-model setting unit that selectively sets the product model;

- a work-model setting unit that selectively sets the work model;

- a jig setting unit that sets a jig for each of the third process and the fourth process;

- a registration setting unit that executes a registration process between the product model and the work model in each of the third process and the fourth process;

- a selection unit, which determines the machining tool to use for the machining of the workpiece and cutting conditions;

- a process-division setting unit that sets a process dividing position between the third process and the fourth process;

- a work-model reversing unit that reverses a direction of the work model by 180 degrees;

- a process-development processing unit that divides the third machining and the fourth machining into the unit of machining; and

- a program-development processing unit that creates the third machining program and the fourth machining program based on information on the divided units of machining of the third and fourth machining processes, the determined machining tool, and the determined cutting conditions.

10. (previously presented): An automatic programming method for creating a machining program for machining a workpiece into a product model with a machining tool, where an area for the machining is determined by using a work model and the product model with a numerical control device for a two-spindle machine having a first main spindle and a sub-spindle and a one-spindle machine having a second main spindle, the automatic programming method comprising:

selecting a type of a machine to use;

creating, when the type of the machine is the two-spindle machine, a machining program comprising:

selectively setting the product model;

selectively setting the work model;

setting a jig for a first process that is performed by using the first main spindle;

executing a registration process between the product model and the work model in the first process;

setting a process dividing position between the first process and a second process that is performed by using the sub spindle;

setting a jig for the second process;

executing a registration process between the product model and the work model in the second process;

dividing a first machining for the first process and a second machining for the second process into the unit of machining;

selecting a machining tool for the machining of the workpiece in the first process and the second process, and cutting conditions; and

creating a first machining program for the first process and a second machining program for the second process based on the divided units of machining, the selected machining tool, and the selected cutting conditions,

creating, when the type of the machine is the one-spindle machine, a machining program comprising:

selectively setting the product model;

selectively setting the work model;

setting a jig for a third process in which a machining is performed by holding one end of the work model with the second main spindle;

executing a registration process between the product model and the work model in the third process;

setting a process dividing position between the third process and a fourth process in which a machining is performed by holding other end of the work model with the second main spindle;

dividing a machining for the third process into a unit of machining;

selecting the machining tool for the machining of the workpiece in the third process and the cutting conditions for the third process;

creating a third machining program for the third process based on the divided units of machining of the third process, the selecting machining tool for the third process, and the selected cutting conditions for the third process;

reversing the work model so that the work model is held by the second main spindle;

setting a jig for the fourth process;

executing a registration process between the product model and the work model in the fourth process;

dividing a machining for the fourth process into a unit of machining;

selecting the machining tool for the machining of the workpiece in the fourth process and the cutting conditions for the fourth process; and

creating a fourth machining program for the fourth process based the divided machining units of the fourth process, the selected machining tool for the fourth process, and the cutting conditions for the fourth process.

11. (previously presented): A computer-readable recording medium that stores a computer program for creating a machining program for machining a workpiece into a product model with a machining tool, where an area for the machining is determined by using a work model and the product model with a numerical control device for a two-spindle machine having a first main spindle and a sub-spindle and a one-spindle machine having a second main spindle, wherein the computer program causes a computer to execute:

selecting a type of a machine to use;

creating, when the type of the machine is the two-spindle machine, a machining program comprising:

selectively setting the product model;

selectively setting the work model;

setting a jig for a first process that is performed by using the first main spindle;

executing a registration process between the product model and the work model in the first process;

setting a process dividing position between the first process and a second process that is performed by using the sub spindle;

setting a jig for the second process;

executing a registration process between the product model and the work model in the second process;

dividing a first machining for the first process and a second machining for the second process into the unit of machining;

selecting the machining tool for the machining of the workpiece in the first and second processes and cutting conditions for the first and second processes; and

creating a first machining program for the first process and a second machining program for the second process based on the divided units of machining, the selected machining tool for the first and second processes, and the selected cutting conditions for the first and second processes,

creating, when the type of the machine is the one-spindle machine, a machining program comprising:

selectively setting the product model;

selectively setting the work model;

setting a jig for a third process in which a machining is performed by holding one end of the work model with the second main spindle;

executing a registration process between the product model and the work model in the third process;

setting a process dividing position between the third process and a fourth process in which a machining is performed by holding other end of the work model with the second main spindle;

dividing a machining for the third process into a unit of machining;

selecting the machining tool for the machining of the workpiece in the third process and cutting conditions for the third process; and

creating a third machining program for the third process based on the divided units of machining of the third process, the selected machining tool for the third process, and the selected cutting conditions for the third process;

reversing the work model so that the work model is held by the second main spindle;

setting a jig for the fourth process;

executing a registration process between the product model and the work model in the fourth process;

dividing a machining for the fourth process into a unit of machining;

selecting the machining tool for the machining of the workpiece in the fourth process and cutting conditions for the fourth process; and

creating a fourth machining program for the fourth process based on the divided units of machining of the fourth process, the selected machining tool for the fourth process, and the selected cutting conditions for the fourth process.

12. (currently amended): A method for creating a machining program for machining a workpiece into a product model, the method comprising:

automatically determining by an automatic programming device a type of machining device controlled by a numeric controller, wherein the type of machining device comprises one of: a two-spindle machine having a first main spindle and a sub-spindle and a one-spindle machine having a second main spindle; and

generating the machining program for the machining of the workpiece into the product model based on the determined type of the machining device,

wherein the machining program generated for the two-spindle machine is different from the machining program generated for the one-spindle machine.

13. (currently amended): A method for creating a machining program for machining a workpiece into a product model, the method comprising:

determining a type of machining device controlled by a numeric controller, wherein the type of machining device comprises one of: a two-spindle machine having a first main spindle and a sub-spindle and a one-spindle machine having a second main spindle; and

generating the machining program for the machining of the workpiece into the product model based on the determined type of the machining device,

wherein the machining program generated for the two-spindle machine is different from the machining program generated for the one-spindle machine.

~~The method according to claim 12, wherein:~~

~~the generating of the machining program for the two-spindle machine comprises:~~

~~creating a first machining program that is performed by using the first main spindle and a second machining program that is performed by using the sub-spindle, and~~

dividing the created first machining and the created second machining into a unit of machining, where the unit of machining comprises both the first machining and the second machining and where, in the unit of machining, a continuous machining is performed with said first main spindle, said sub-spindle, and a machining tool that machines the workpiece into the product model; and the generating of the machining program for the one-spindle machine comprises: creating a third machining program and a fourth machining program that are performed by using the second main spindle, and dividing the third machining program and the fourth machining program into the unit of machining, separately for the third machining program and the fourth machining program.

14. (previously presented): The method according to claim 12, wherein the machining device executes at least one of rotating and shaving the workpiece into a round shape product model, boring for rotating the workpiece and boring therein, milling for fixing the workpiece and shaving the workpiece, and surface machining the workpiece and wherein said determining comprises automatically determining by the numeric controller whether the machining device is the two-spindle machine or the one-spindle machine.